Web 3.0 Semantic Exchange System for Public Economy Built on Blockchain

Zartashya Ashraf, Kashaf Fatima and Fatima Anwar

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Abstract

The next-generation Internet, known as Web 3.0, allows users to view, write, and own material independently of one another. Blockchain, semantic communication, edge computing, and artificial intelligence are the primary factors driving it because they can build value networks to accomplish participation economics based on participatory decision-making. To accomplish decentralized semantic sharing and precise information transmission, Web 3.0 can incorporate the traits of blockchain, semantic extraction, and communication. However, contemporary Web 3.0 solutions ignore the contributions of other new technologies to Web 3.0 and instead concentrate on the blockchain. In order to further realize the benefits of semantic extraction and communication in Web 3.0, we suggest a blockchain-based semantic exchange paradigm in this article. For semantic sharing in this paradigm, we first try to tokenize semantic data into Non-Fungible Tokens (NFT). Then, to maximize purchasing and pricing tactics for semantic trading, we use a Stackelberg game. We also use Zero-Knowledge Proof to share genuine semantic information without making it public before getting money, which can result in more equitable and private dealing than is currently possible on NFT platforms. An urban planning case study is provided to plainly demonstrate the suggested processes. Finally, a number of issues and chances are noted.

Introduction

A blockchain-based semantic exchange framework for Web 3.0 can facilitate the development of a participatory economy by enabling decentralized, peer-to-peer transactions without intermediaries. This framework can leverage the power of blockchain technology to establish trust, transparency, and immutability in economic transactions.[1] Semantic technologies can be integrated with blockchain to provide a shared understanding of the meaning of data exchanged between parties. This can facilitate interoperability between different blockchain networks and enable the creation of smart contracts that can be automatically executed based on predefined conditions.[2] One potential application of this framework is in the creation of decentralized marketplaces where participants can buy and sell goods and services using cryptocurrencies.[3] Smart contracts can be used to ensure that transactions are executed only when certain conditions are met, such as the delivery of goods or the completion of services.

Another potential application is in the creation of decentralized autonomous organizations (DAOs), where participants can collectively make decisions about the management of shared resources. Smart contracts can be used to automate decision-making processes and ensure that all participants have a say in the direction of the organization. Overall, a blockchain-based semantic exchange framework for Web 3.0 can facilitate the development of a participatory economy by enabling decentralized, peer-to-peer transactions without intermediaries.[4] This can help to reduce transaction costs, increase transparency, and enable greater participation in economic activities.

The opportunities of blockchain in health 4.0

Blockchain technology has the potential to revolutionize the healthcare industry and play a significant role in the evolution of Health 4.0. Health 4.0 is a term that refers to the next generation of healthcare, which is characterized by the use of advanced technologies such as artificial intelligence, the Internet of Things, and big data analytics to improve patient outcomes and reduce costs. Here are some of the opportunities that blockchain technology can bring to Health 4.0: Secure and transparent data sharing: Blockchain technology can enable secure and transparent sharing of health data between patients, healthcare providers, and researchers.[5] This can help to improve patient outcomes by ensuring that healthcare providers have access to the most up-to-date and accurate information about a patient's health status. Decentralized electronic health records: Blockchain technology can enable the creation of decentralized electronic health records (EHRs) that are accessible to patients and healthcare providers. This can help to improve patient outcomes by enabling healthcare providers to make more informed decisions about patient care.[6] Patient-controlled data: Blockchain technology can enable patients to have more control over their health data by allowing them to give permission for their data to be shared and who can access it. This can help to improve patient outcomes by enabling patients to be more engaged in their own care.

Clinical trials: Blockchain technology can help to improve the efficiency and transparency of clinical trials by enabling the creation of secure and transparent databases of patient data.[7] This can help to speed up the development of new treatments and improve patient outcomes. Supply chain management: Blockchain technology can enable the creation of secure and transparent supply chains for pharmaceuticals and medical devices. This can help to reduce the risk of counterfeit products entering the supply chain and ensure that patients receive safe and effective treatments. Overall, blockchain technology has the potential to bring significant benefits to Health 4.0 by improving patient outcomes, reducing costs, and increasing efficiency and transparency in the healthcare industry.[8]

The transition to a completely automated environment using exponential technology like Artificial Intelligence (AI), the Internet of Things (IoT), Sensor Networks, and Blockchain paradigms is anticipated to be the next significant move into the future. We are currently experiencing the Fourth Industrial Revolution, which is profoundly altering how we work, reside, and engage with one another and technology.[9] Industry 4.0 is a new age of connectivity and interaction between components, machines, and people that has the potential to significantly increase output and efficiency while also enhancing human well-being and achieving sustainable environmental results. The adoption of technologies that enable the digitization of medical data and the automation of numerous conceivable clinical processes is currently taking place in the healthcare sector. The industry has experienced its own evolution and is currently at Healthcare Version 3.0, an extension of Web 3.0, which includes more accessibility of healthcare information to people and personalization to enhance user experience.[10] The two changes will be combined to create the new age of health 4.0, and this is where the newly emerging Blockchain Technology could play a significant role. The demand for trusted and transparent documentation of individual health data, the requirement for interoperability across clinical departments within the same hospital, and the requirement for updated sets of records for reference across multiple healthcare facilities all push the use of blockchain concepts in our effort to transform healthcare services.[11]

Conclusion

User-generated material and user-selected sources are supported by Web 3.0. Users can view, create, and own material with Web 3.0 thanks to decentralized wireless edge computing architectures. Blockchain, which offers security services by documenting content in a decentralized and open way, is a key technology that allows Web 3.0 objectives. However, the rapid growth in users and the explosion of on-chain stored material result in an unaffordable use of processing and storage resources. Analyzing the semantic information of contents that can accurately communicate the intended meanings without requiring a lot of resources is a hopeful paradigm. In this paper, we suggest a united paradigm for blockchain-semantic ecosystems that supports Web 3.0's wireless peripheral intelligence. Six essential elements make up our system for exchanging conceptual demands. Then, in order to implement on-chain and off-chain exchanges of Web 3.0 ecosystems on semantic verification methods while preserving service security, we present an Oracle-based proof of semantic mechanism. Oracle has developed an adaptive Deep Reinforcement Learning-based sharing method to increase interaction efficiency, which can help Web 3.0 networks handle a range of semantic demands. In order to demonstrate how the suggested framework can flexibly modify Oracle settings in response to various semantic demands, a case study is given at the end.

Reference

[1] C. Xiang *et al.*, "Towards continuous access control validation and forensics," in *Proceedings of the 2019 ACM SIGSAC conference on computer and communications security*, 2019, pp. 113-129.

[2] H. Huang, M. Wen, L. Wei, Y. Liu, and S.-C. Cheung, "Characterizing and detecting configuration compatibility issues in android apps," in *2021 36th IEEE/ACM International Conference on Automated Software Engineering (ASE)*, 2021: IEEE, pp. 517-528.

[3] Y. Li, B. Shen, J. Zhang, X. Gan, J. Wang, and X. Wang, "Offloading in HCNs: Congestion-aware network selection and user incentive design," *IEEE Transactions on Wireless Communications,* vol. 16, no. 10, pp. 6479-6492, 2017.

[4] Y. Tao, J. Jiang, Y. Liu, Z. Xu, and S. Qin, "Understanding performance concerns in the api documentation of data science libraries," in *Proceedings of the 35th IEEE/ACM International Conference on Automated Software Engineering*, 2020, pp. 895-906.

[5] Y. Tao, S. Tang, Y. Liu, Z. Xu, and S. Qin, "How do api selections affect the runtime performance of data analytics tasks?," in *2019 34th IEEE/ACM International Conference on Automated Software Engineering (ASE)*, 2019: IEEE, pp. 665-668.

[6] Y. Tao, Z. Chen, Y. Liu, J. Xuan, Z. Xu, and S. Qin, "Demystifying “bad” error messages in data science libraries," in *Proceedings of the 29th ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering*, 2021, pp. 818-829.

[7] H. Huang, B. Shen, L. Zhong, and Y. Zhou, "Protecting Data Integrity of Web Applications with Database Constraints Inferred from Application Code," in *Proceedings of the 28th ACM International Conference on Architectural Support for Programming Languages and Operating Systems, Volume 2*, 2023, pp. 632-645.

[8] B. Shen *et al.*, "Can Systems Explain Permissions Better? Understanding Users' Misperceptions under Smartphone Runtime Permission Model," in *USENIX Security Symposium*, 2021, pp. 751-768.

[9] B. Shen, T. Shan, and Y. Zhou, "Improving Logging to Reduce Permission Over-Granting Mistakes."

[10] B. Shen, *Automatic Methods to Enhance Server Systems in Access Control Diagnosis*. University of California, San Diego, 2022.

[11] D. Ghelani and T. K. Hua, "Conceptual Framework of Web 3.0 and Impact on Marketing, Artificial Intelligence, and Blockchain."